Bismuth oxide nanoparticles/chitosan/modified electrode as biosensor for DNA hybridization.

Abstract

An electrochemical DNA biosensor based on nanoparticles bismuth oxide Bi2O3 for DNA immobilization and hybridization detection is presented. The nano Bi2O3/chitosan-modified gold electrode (AuE) was fabricated and oligonucleotides were immobilized onto the AuE surface with the use of activating reagents – water soluble 1-ethyl-3(3'-dimethylaminopropyl)-carbodiimide (EDC) and N-hydroxy sulfosuccinimide (NHS). Hybridization was induced by exposure of the ssDNA-containing AuE to complementary target DNA in solution. The electrochemical behavior of methylene blue (MB) on the ssDNA and dsDNA modified electrode were carefully monitored by cyclic voltammetry (CV) analysis. The increases in the anodic peak current of MB were observed upon hybridization of probe with the target complementary DNA. Selectivity and sensitivity of this assay were also investigated in order to determine the specificity of the hybridization detection. This is the first application of chitosan combined with nano Bi2O3 for the fabrication of an electrochemical DNA biosensor with a favorable performance for the detection of specific hybridization.

Keyword: Nanoparticles bismuth oxide; Methylene blue; Dna hybridization; Electrochemical DNA biosensor.